CRJ-700 Alerting Issues – Uncommanded yaw or roll

1. Initiating Condition: Wake encounter

Type	Alert or cue	Threshold for alert or cue to be presented	Confusion regarding alert or cue	Other issues with regard to alert or cue	When alert is inhibited/suppressed or when cue is masked	How alert or cue is terminated
Visual Alerts	None					
Aural Alerts	"BANK ANGLE"	When bank angle exceeds predetermined value as determined by radio altitude.30 ft and below (10 degrees bank) 30 to 150 ft (linear from 10 degrees to 40 degrees bank). Above 150 ft AGL (excess of 40 degrees of bank)	Alert not definitive as to cause			Reduction of bank angle
Tactile Alerts	None					
Visual Cues	Roll rate on PFD/EADI		Underlying cause of the yaw/roll may not be cued, or the cues may be ambiguous/require effortful interpretation	Pilots may be warned about the pending possibility of a wake encounter by ATC or actually see the aircraft and deduce this themselves		
Aural Cues	None					
Tactile/ Somatic Cues	Wheel may move opposite the roll if autopilot is engaged.		Underlying cause of the wheel deflection may not be cued, or the cues may be ambiguous/require effortful interpretation			

CRJ-700 Alerting Issues – Uncommanded yaw or roll

1. Initiating Condition: Wake encounter – Cont.

Expected Pilot Response(s)

- Disconnect autopilot/autothrottle. Apply thrust as required depending on the nature of the roll upset (nose low vs. high)
- Verify symmetrical thrust
- Apply opposing roll and/or yaw inputs to control aircraft attitude
- Recover from nose-down upset if necessary
- Confirm spoilers are retracted

Possible sources of confusion with regard to pilot response(s)

- Pilots may have to react to an uncommanded roll with different controls (wheel vs. rudder pedals) depending on the cause, which will probably be unclear based on the lack of definitive cues and the extreme time pressure.

How does pilot know condition is resolved/recovered?

- Condition is resolved when aircraft control is regained.

Issues with regard to multiple concurrent non-normal conditions

- Pilots may be confronted with unusual flight control difficulties and/or alerts/cues as they cope with a roll or yaw/roll upset

CRJ-700 Alerting Issues – Uncommanded yaw or roll

2. Initiating Condition: Uncommanded rudder deflection or rudder pedal kicks

Type	Alert or cue	Threshold for alert or cue to be presented	Confusion regarding alert or cue	Other issues with regard to alert or cue	When alert is inhibited/ suppressed or when cue is masked	How alert or cue is terminated
Visual Alerts	None					
Aural Alerts	"BANK ANGLE"	When bank angle exceeds predetermined value as determined by radio altitude.30 ft and below (10 degrees bank) 30 to 150 ft (linear from 10 degrees to 40 degrees bank). Above 150 ft AGL (excess of 40 degrees of bank)	Alert not definitive as to cause			Reduction of bank angle
	Single chime caution message for "YAW DAMP"	Unknown if the rapid rudder movement will disengage the yaw damp system				Re-engage both channels of yaw damp system
Tactile Alerts	None					
Visual Cues	Roll rate on PFD/EADI		Underlying cause of the yaw/roll may not be cued, or the cues may be ambiguous/require effortful interpretation			
	Yaw rate on PFD/EADI slip/skid indicator					

CRJ-700 Alerting Issues – Uncommanded yaw or roll

2. Initiating Condition: Uncommanded rudder deflection or rudder pedal kicks – Cont.

Aural Cues	None					
Tactile/ Somatic Cues	Wheel may move opposite the roll if autopilot is engaged.		Underlying cause of the wheel deflection may not be cued, or the cues may be ambiguous/require effortful interpretation			
	In the case of rudder kick, might be felt if feet on rudder pedals as movement on one side will move the other side					

Expected Pilot Response(s)review reference flight control disconnects

- Disconnect autopilot/autothrottle
- Verify symmetrical thrust
- Apply opposing roll and/or yaw inputs to control aircraft attitude, using significant force if necessary
- Reduce AOA/pitch/altitude as required to regain roll authority
- Disconnect yaw damper if cause is a jammed rudder. Other causes such as rudder limiter jammed or rudder trim runaway do NOT call for yaw damp to be disconnected.
- Recover from nose-down upset if necessary
- Confirm spoilers are retracted

Possible sources of confusion with regard to pilot response(s)

- Pilots may have to react to an uncommanded roll with different controls (wheel vs. rudder pedals) depending on the cause, which will probably be unclear based on the lack of definitive cues and the extreme time pressure.

How does pilot know condition is resolved/recovered?

- Condition is resolved when aircraft control is regained and uncommanded control deflections have been either neutralized or compensated for in all anticipated circumstances for the remainder of the flight.
- If there are residual uncommanded control deflections or pressures, there may be operational implications through to landing (e.g., crosswind limitations)

Issues with regard to multiple concurrent non-normal conditions

- Pilots may be confronted with unusual flight control difficulties and/or alerts/cues as they cope with a roll or yaw/roll upset

CRJ-700 Alerting Issues – Uncommanded yaw or roll

3. Initiating Condition: Uncommanded aileron/spoiler/flap/slat deflection

Type	Alert or cue	Threshold for alert or cue to be presented	Confusion regarding alert or cue	Other issues with regard to alert or cue	When alert is inhibited/ suppressed or when cue is masked	How alert or cue is terminated
Visual Alerts	Master caution light will flash until selected	When any of the following caution messages appear: FLT SPLR DEPLOY GND SPLR DEPLOY				Pressing the master caution switchlight
Aural Alerts	Caution message single chime	When Master caution light is illuminated				None, only a single chime, does not repeat unless another caution message is presented.
	"BANK ANGLE"	When bank angle exceeds predetermined value as determined by radio altitude.30 ft and below (10 degrees bank) 30 to 150 ft (linear from 10 degrees to 40 degrees bank). Above 150 ft AGL (excess of 40 degrees of bank)	Alert not definitive as to cause			
Tactile Alerts	None					Reduction of bank angle
Visual Cues	Roll rate on PFD/EADI		Underlying cause of the yaw/roll may not be cued, or the cues may be ambiguous/require effortful interpretation			
	Yaw rate on PFD/EADI slip/skid indicator					

CRJ-700 Alerting Issues – Uncommanded yaw or roll

3. Initiating Condition: Uncommanded aileron/spoiler/flap/slat deflection – Cont.

Type	Alert or cue	Threshold for alert or cue to be presented	Confusion regarding alert or cue	Other issues with regard to alert or cue	When alert is inhibited/suppressed or when cue is masked	How alert or cue is terminated
Aural Cues	None					
Tactile/ Somatic Cues	Wheel may be deflected in opposite direction if autopilot is engaged		Underlying cause of the wheel deflection may not be cued, or the cues may be ambiguous/require effortful interpretation			

Expected Pilot Response(s) review reference flight control disconnect

- Disconnect autopilot/autothrottle
- Verify symmetrical thrust
- Apply opposing roll and/or yaw inputs to control aircraft attitude, using significant force if necessary to activate breakout features in the event of control jam
- Recover from nose-down upset if necessary
- Confirm spoilers are retracted

Possible sources of confusion with regard to pilot response(s)

- Pilots may have to react to an uncommanded roll with different controls (wheel vs. rudder pedals) depending on the cause, which will probably be unclear based on the lack of definitive cues and the extreme time pressure.

How does pilot know condition is resolved/recovered?

- Condition is resolved when aircraft control is regained and uncommanded control deflections have been either neutralized or compensated for in all anticipated circumstances for the remainder of the flight.
- If there are residual uncommanded control deflections or pressures, there may be operational implications through to landing (e.g., crosswind limitations)

Issues with regard to multiple concurrent non-normal conditions

- Pilots may be confronted with unusual flight control difficulties and/or alerts/cues as they cope with a roll or yaw/roll upset